RECLAMATION

era

A Water Review Quarterly

Summer 1974

Summer 1974 Vol. 60 No. 3

RECLAMATION era

Kathleen Wood Loveless, Editor

Contents

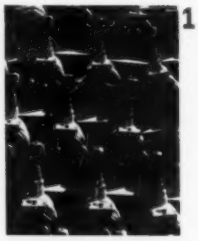
COVER. A Greco-Buddhist stucco head, about 4th Century, is among the many treasures from the land of Aladdin. See article on page 10.

United States Department of the Interior
Rogers C. B. Morton, Secretary

Bureau of Reclamation,
Gilbert G. Stamm, Commissioner

Issued quarterly by the Bureau of Reclamation, United States Department of the Interior, Washington, D.C. 20240. Use of funds for printing this publication approved by the Director, Office of Management & Budget, August 14, 1969.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price 75 cents (single copy). Subscription price: $2.70 per year (70 cents additional for foreign mailing).



IRRIGATION

Help or Hindrance

By LEWIS D. WALKER, Economist, Division of Water and Land, Bureau of Reclamation, Washington, D.C.

Until American consumers saw empty shelves at the supermarket and had to pay higher prices for available products, they gave little thought to where food originated or what was required to provide it. In fact, until recently we, as a Nation, had become rather complacent about the agricultural sector of our economy

During the late 1950's and through the 1960's, farm surpluses were a thorn in the side of agricultural policymakers. The public thought the surpluses were more a disadvantage than an advantage. Further, the public was critical of the Government's involvement in agriculture. Too many people overlooked the stabilizing effect of the commodity purchase and storage programs.

These programs provided for a stable market and maintained supplies to meet the needs during national emergencies and extreme weather adversities. Both programs benefited consumers, but their value was not appreciated.

Now in retrospect, a dependable market, where consumers do not have to stockpile or worry about erratic price changes, seems highly desirable.

U.S. agriculture has always been able to provide an abundance of food for consumers at reasonable prices and still have enough left to sell abroad and to give away to underprivileged people.

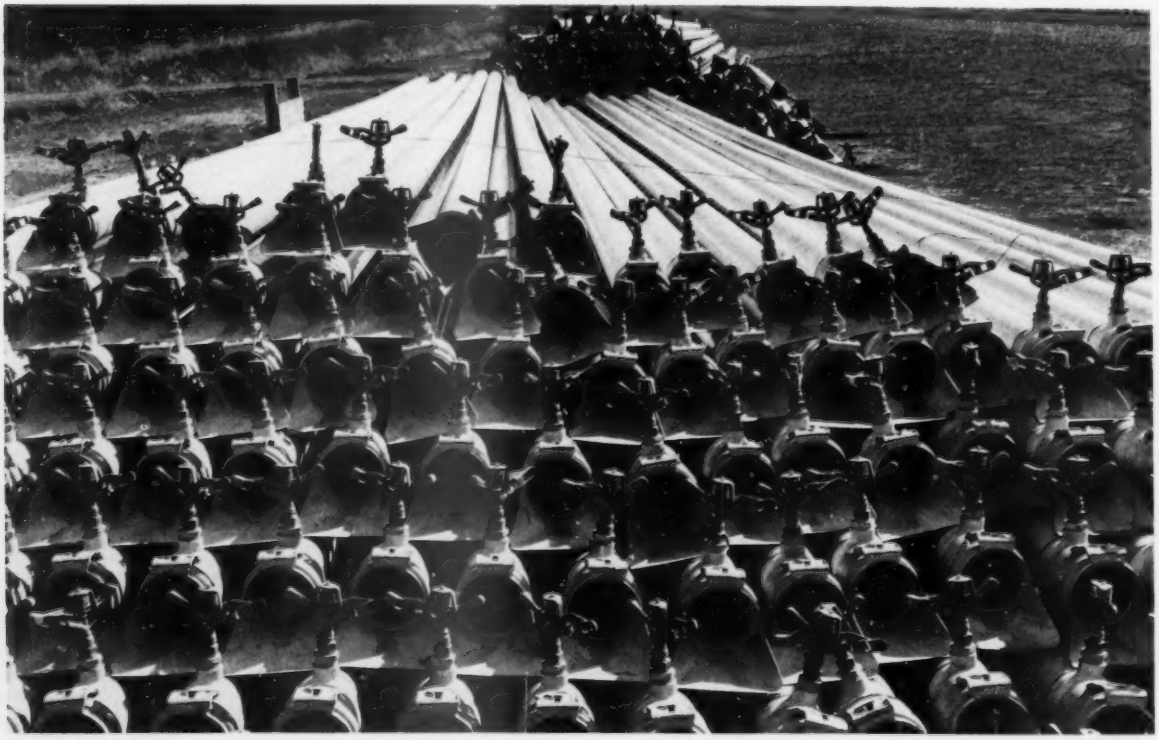
During the 1972–73 period, the agricultural situation completely changed. The surpluses disappeared and record-high prices were established three to four times their normal levels ($12 per bushel for soybeans, $5 per bushel for wheat, $3 per bushel for corn, and $0.90 per pound for cotton). Instability in United States and world food supplies and fear of crop failure became a prime concern.

Adverse weather struck crops in Africa, Australia, Russia, India, and to a lesser degree in the United States. The Peruvian fish catch dropped nearly to zero, eliminating a good source of low-cost, high-protein feed supplement.

At the same time, new trade channels were opened to Russia, the People's Republic of China, and other Communist countries. Income and population increases in the non-Communist countries provided expanded sales opportunities for United States exporters. Furthermore, two devaluations of the U.S. dollar made it easier for foreigners to purchase U.S. products.

Consequently, the United States began exporting more agricultural products, which for fiscal year 1972 amounted to $8 billion and for fiscal year 1973, $13 billion. The estimated level for fiscal year 1974 is $20 billion.

With the tremendous export boom, can U.S. agriculture meet the challenge of providing for the world market and domestic consumer needs? The answer to this question is further complicated when we consider some internal factors that influence U.S. agricultural productive capacity. They are: (1) the dwindling farm labor supply, (2) the shrinking number of farm operators—most now average over 51 years of age, (3) fewer youth staying on farms, (4) the loss of prime agricultural land to nonfarm uses, (5) the high investment required for farm operation, and (6) a deemphasis on Federal assistance to irrigation and other agricultural programs. These factors all play a role in determining



Row upon row of irrigation sprinklers are ready to irrigate the rich orchards of the Central Valley project, Calif.

Barley is one of many grains grown with the assistance of irrigation.

our agricultural productive capacity. They also are a force in driving up crop prices.

Other Restrictions

The restriction on the use of DDT and other chemicals is another element effecting crop production. The low-cost chemicals used to control insects, diseases, and weeds, can no longer be taken for granted. New methods of control are being researched such as reduction of insect populations by sterilization, selection of only the most disease-resistant crops, and the use of insects for weed control. However, this effort will be expensive and it takes time.

The energy crisis, another consideration, limits fuel used on the farm and may impair the United States' ability to produce, process, and transport agricultural products. Since ours is a highly mechanized type of agriculture, the effect of the energy shortage could be significant.

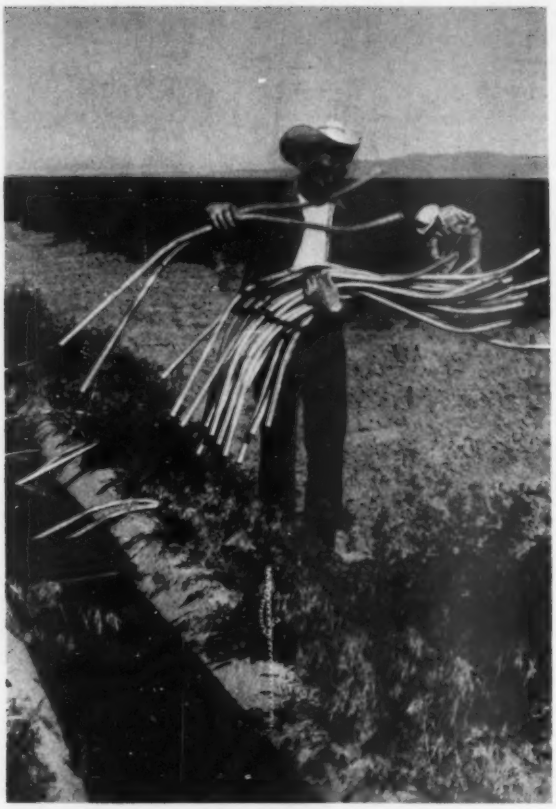
Weather also has an extensive influence on productive capacity and is the most difficult factor to predict. In 1973, devastating floods in the Mississippi Valley and the drought in the Pacific Northwest reduced agricultural production. At this writing, a drought is threatening the early crops in the Texas High Plains, in parts of Oklahoma, and in eastern New Mexico. Experts contend that even a mild drought will reduce the 1974 crop, causing prices to remain high.

When large agricultural exports in 1972 and 1973 placed a strain on domestic supplies and caused the U.S. food prices to soar, consumers complained that sales to foreign countries had depleted local supplies and had been a significant factor in causing the high prices. One need only check the food-price index to realize that their complaints are justified.

Balance of Trade

Why not stop exports to protect our domestic market? Even though this would be a simple approach, it is not quite that easy. We like to import goods (cars, cameras, television sets, radios, clothing, petroleum products, etc.) from other countries to make life more comfortable. We need the revenue from the exports to pay for the imports; and, without exports, we would not have a favorable balance of trade. Since our agricultural products have been our chief export commodity, foreign countries must have confidence in our ability to supply food products on a dependable basis. If we increase our exports, we must expand production to have sufficient supplies for both domestic and foreign use.

It is noteworthy that in fiscal year 1974, the U.S. agricultural contribution to the U.S. trade balance is expected to be at an all-time high of around $10 billion. This will provide a favorable trade balance in 1974, a first in several years.



Bob Sanchez sets siphons in an irrigation ditch to bring water to the crops.

Deep well pumps are another source of irrigation water.

Four Billion People

It is difficult to estimate how long the overseas trade will continue to expand. We do know that world population is expected to be 4 billion people by next year and these people will be demanding better diets every day. Trade with Russia, China, and other Communist countries offers potential markets that have not been considered in projecting foreign trade levels for over 25 years.

The Role of Irrigation

What role can irrigated agriculture play in a national agricultural policy? What advantages does this type of production offer? Let's look at some answers. Irrigation increases production considerably and it reduces the risk of crop failure brought on by drought. Irrigation allows diversity of crop production, relieving an area from dependency on a one-crop economy.

A wider variety of crops, particularly vegetables and fruits, provides a better diet. Irrigation in the Southwest enables production in the off-season, hence allowing this wider variety during winter months. Because of the high yield allowed by irrigation, the amount of land needed for crop production is lessened. About 1.5 million acres of agricultural land are converted to other uses each year, of which a significant portion is considered prime cropland. Where the demand for land is high for other uses, irrigation releases land for these uses without seriously reducing total production.

Irrigation offers more security and less risk to a farmer trying to get started in agriculture and to those already in agriculture. Greater security to a farmer may provide more incentive to stay on the farm.

Irrigation also allows more diversification in crop production. This is significant since the whole farm income does not depend upon the success or failure of just one crop. With several crops, his gains can balance out his losses.

Irrigated agriculture provides another potential advantage in energy conservation. Irrigated land requires less fuel per unit of crop production than dry-farmed land. Preliminary studies on corn production in Nebraska demonstrate that 20 to 40 percent less energy is required per bushel for corn grown on irrigated farmland than on dryland. Also, irrigated land concentrates production for more efficient processing and transportation. Where there are enough crops from irrigated land, processing businesses can locate nearby. Since the supplies are available and dependable, efficiency in processing increases.

Irrigation has some disadvantages too. First, in certain areas it requires a relatively high investment to regulate and transport water to the lands. Second, other users are in competition for the water (for municipal and industrial uses and hydroelectric power production) and they usually are capable of paying much higher rates for the water. Further, many citizens used

Margaret Marshall displays some of the finest strawberries grown on the Central Valley project, Calif.

to critize any form of subsidies to irrigation because it only added to surpluses. However, with the surpluses gone and the high food prices remaining, the consumers might change their attitude toward Federal assistance to irrigation.

Study the Projects

Successful irrigation projects require careful study and development by highly skilled resource development specialists. Detailed studies are vital to assure reliable and dependable project service. Failure to give proper consideration to all aspects of the water management problem usually results in a poorly developed project.

Irrigation is still a viable way to solve our agricultural needs. For years, there has been an increase in pump irrigation, largely by individual farmers. This expansion may not be true for long. In some areas of the West, particularly the Texas High Plains, ground water is being depleted. As a result there may be decreases rather than increases in pump-irrigated acres in the future.

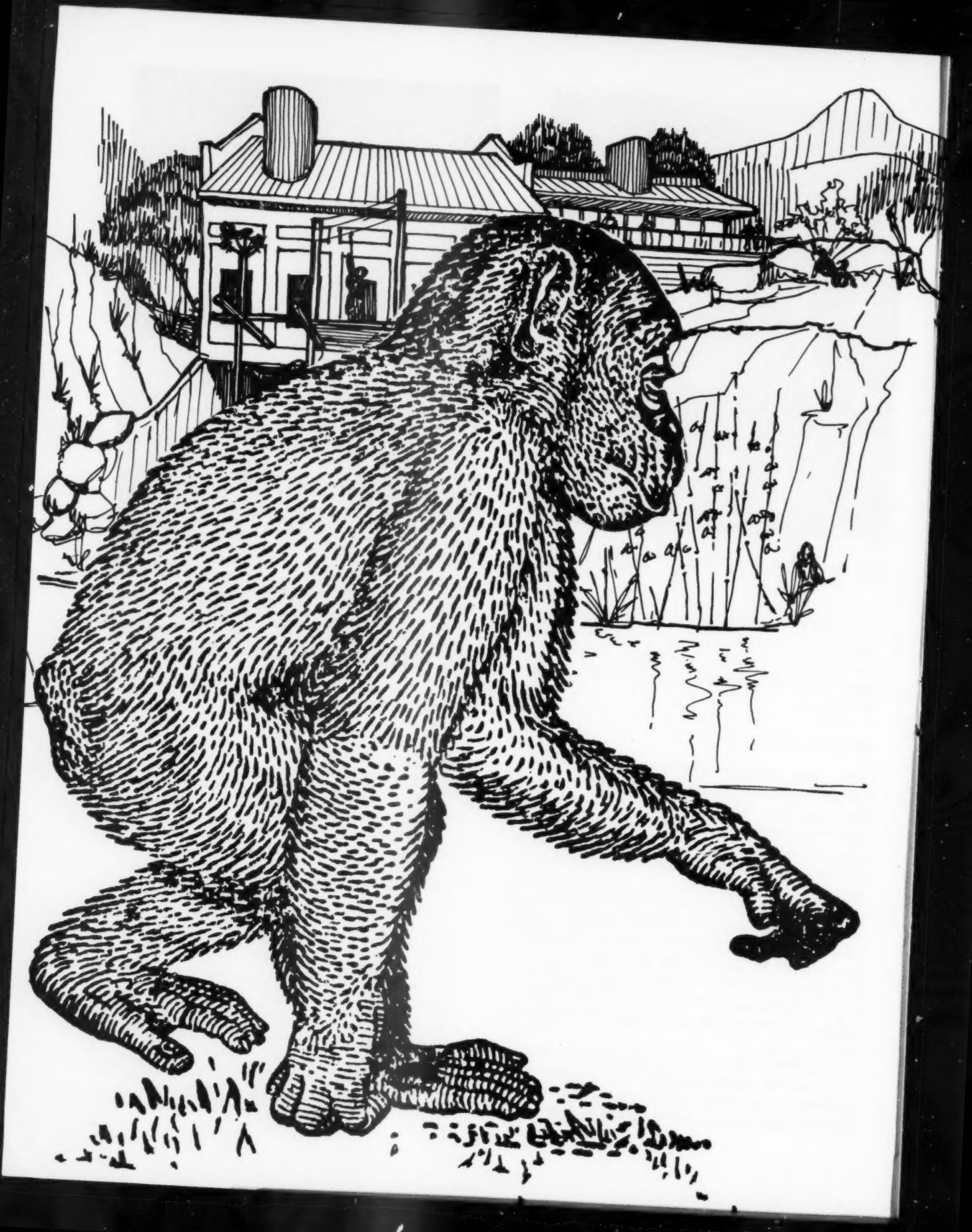
Still, these areas could be developed for surface irrigation, but constraints that limit water resource development are present. Some ways to reduce relative irrigation costs include: limiting crops to those with a high output per unit of water, and using new techniques such as trickle irrigation.

Tony Dahilig seems to enjoy this honeydew melon, one of the major products grown in the Central Valley, Calif.

Irrigation may continue to play a larger role in the future in providing food. Thus, policy options should be kept open to provide flexibility in meeting future demands.

A Brighter Future

At the 1974 Agriculture Outlook Conference, a Department of Agriculture official placed irrigated agriculture in its proper perspective when he said, "If farmers are going to continue to increase production, most of the gains will have to come through investments in technology. The investments they're considering now will take a longer period to pay off—investments like terracing, (and) irrigation . . . For the long term, I believe the outlook for American farmers is excellent. I think the world is moving toward fuller use of its agricultural resources . . ."



Who says the Bureau of Reclamation is monkeying around? Well, nobody—but the Bureau *is* helping a Tempe, Ariz., couple establish a home for unwanted champanzees.

The Bureau has leased 40 acres of land to Jo and Paul Fritz to establish living quarters for 14, and soon to be more, champanzees. The land is northeast of Mesa, Ariz., and was originally the site of a Salt River project hydroelectric plant, built in the 1920's. The Salt River project, one of Reclamation's first, was authorized by the Secretary of the Interior on March 14, 1903, only months after the Reclamation Service had been established in 1902.

The plant's remains—viaducts, canal systems, and the large shell of a concrete building—will all be used to create outdoor island areas and indoor cages for the champanzees. The 40 acres will be divided into islands, each containing shelters, climbing facilities, and varied terrains. Only students, investigators, animal keepers, and occasionally members of the Primate Foundation of Arizona will be allowed to observe. There will be no general public visitation.

The main building will have two floors with an observation deck on top. The ground floor will contain the cages where the chimps may be observed daily for signs of illness or possible injury. The second floor will contain offices, nursery, treatment rooms and all other facilities necessary for good care. And two large areas will be developed into indoor play cages, in case of inclement weather.

"But why all this fuss," you may be asking. Jo Fritz explained that the chimpanzee is being threatened with extinction. To capture a wild baby, one must first kill the mother. It is estimated that for every live arrival into the importing country, four to six mothers have to be killed. Each mother could have produced about 10 offspring in her lifetime. This is a potential loss of 40 to 60 chimpanzees. Today, there are about 1,000 chimpanzees in the United States and an additonal 350 are being imported each year. One needs only to multiply these figures and add other importing countries to understand why the wild chimpanzee population is endangered.

Paul Fritz, president of the foundation and its resident director was born in Berlin, Germany. He worked in European zoos for many years before coming to the United States. He has had 20 years' experience working with chimpanzees and has a broad background in handling exotic animals. Jo, who also has had experience working with exotic animals, has long been concerned about the chimpanzee, and is now doing something about them.

General Aims of the Foundation

The foundation has established three basic aims: first, to breed enough chimpanzees in captivity at least to slow down some of the wild chimpanzee importation. This is done by mating the chimps already in the United States. The foundation will not import chimps. Proof that breeding in captivity is possible came with the first birth in the colony on January 28, 1973.

The second aim of the foundation is to solve the problem of unwanted chimpanzees now in captivity. Until now, there has been no place for captive chimps once they outgrew their homes, became too difficult to handle, or served their usefulness as laboratory animals. Many have been destroyed as a result.

Jo explained, "For some families, giving up the pet chimp is like giving up one of the family." She has seen incidents where a couple has acquired a baby chimpanzee when it was yet small, cute, and controllable. "The couple dresses and teaches their new 'child' to look and act just like a human being.

"Then suddenly, sometimes as long as 4 years later, it becomes completely uncontrollable. It begins to smash furniture, throw food around, and hurt small children as it plays with them. Perhaps the most difficult time for the couple is when they finally realize the animal is not a human and is now following its natural instincts," Jo explained.

A NEW HOME FOR CHIMPANZEES

Jo and Paul Fritz have worked to provide a new home for unwanted chimpanzees.

Photo Courtesy, *The Arizona Republic*

She said, "It is sad to watch a couple drive up with their fully-dressed chimpanzee and walk it to a cage where it is locked behind bars."

The third aim of the foundation is to provide opportunities for students and investigators to study these animals. The new site will allow for controlled educational tours and lectures. Even though the foundation will not be open to the general public, it will allow certain groups and organizations to visit. They will be able to view the chimps from observation decks built around the periphery of the islands.

Already, a graduate anthropology student is using the colony as basis for a master's thesis. Graduate and undergraduate students are also using the colony to obtain information for class papers and a Scottsdale Community College student is using the chimps in a television film.

The foundation also offers a public speaker who is available to speak to organizations such as Kiwanis, Rotary Clubs, etc.

Time and Food Donated

All time spent caring for the chimpanzees is given by Paul Fritz. Seventy-five percent of all food for the chimps is donated by a local supermarket. Even all administrative work, including clerical assistance, is contributed by Arizona State University students.

Chimp Life Span

Chimpanzees mature in about 10 years and their life span approaches 50 years. Since the foundation is so interested in breeding new chimps it has had to become familiar with their breeding and nurturing habits. The gestation period is about 8½ months. Babies born in the wild stay with their mothers until they are 4 years old.

The Fritzes will remove babies from their mothers at about 1 year of age since the mother will not breed while nursing a young. At 1 year, the baby has received enough "education" from its mother so that, given the proper surroundings, it will be a near-normal chimpanzee in adulthood. Near-normal means as near as possible without having been raised in the wilds.

Foundation Policies

The primal farm, when completed, will be the only one of its kind in the United States. This sanctuary for retired circus performers, laboratory specimens, and misplaced house pets will undoubtedly aid in the preservation of the chimp. And you animal-lovers can rest assured that those funny chimps who mimic humans so well, will be around to do so for many years to come.

WATER QUIZ

1. Far from being a featureless plain, the ocean floors are dotted with towering isolated pinnacles, called seamounts, which rise _____ feet above the floor.
   a. 600
   b. 8,500
   c. 2,275
   d. 3,000

2. In some places around the margins of the ocean basin, great chasms or ocean deeps, plunge 20,000 feet or more below the level of the ocean surface. True or false?

3. Despite wide fluctuations in total salinity, sodium chloride represents about _____ percent of the soluble salts in the ocean.
   a. 70
   b. 55
   c. 50
   d. 30

4. The two most important dissolved gases in sea water to organic development are _____.
   a. oxygen and hydrogen
   b. carbon dioxide and helium
   c. carbon dioxide and oxygen
   d. hydrogen and carbon dioxide

5. Why do the polar seas have more life-giving dissolved gases than tropical waters and hence are more prolific of life, especially during the long summer days when sunlight is available for photosynthesis?

TREASURES

From the Land of Aladdin

One of the Nation's finest private collections of Persian art is the property of a bachelor residing in Cheyenne, Wyo. The ancient pieces of art, some dating back to 5,000 B.C., belong to Owen David Mort, Jr., a civil engineer for the Bureau of Reclamation.

Mort has an engineering degree from the University of Nevada, where he graduated in 1956. While working for the Agency for International Development (AID) in Washington, D.C., he stumbled upon the nucleus of his Persian collection.

Mort was studying at the Corcoran School of Art parttime and working weekends at Simon Krieger, Inc., an Oriental art dealership. The firm had a 120-piece collection appraised at $45,000. The heirs of the original collection were eager to sell it. Mort offered $5,700 and they accepted his offer.

The most Mort has paid for a single item was $1,200. He has bought most of his collection piecemeal for much smaller amounts. "You have to find pieces on the spot—before they get to a collector's market," he said. According to the Smithsonian Institution and M. H. DeYoung Museum in San Francisco, the entire collection is worth approximately one-half million dollars. However, his actual investment is one-tenth that amount.

When an assignment in Afghanistan with AID opened in 1969, Mort applied. While working in Afghanistan, he made friends with the natives, encouraging them to bring him the figures and fragments they found while farming. He paid them about 10 cents for each item they brought him. Mort bought a lot of junk, but gradually items of worth turned up.

After 6 months of searching for the site where the valuable items had been found, he finally found it. It had previously been unexplored by scientists. Mort bought about 4,500 pieces found in this area. But he kept only 250 and gave the rest to the Afghan Government's museum in Kabul.

It was during this tour of duty that Mort found a hand-carved wooden cotton gin, still in use in the village where he lived. This type of machine has been used for 500 years in the Orient. It can strip cotton fiber from the seeds and comb the fiber.

Mort displays a few pieces from his collection on shelves he built. He has a large basement and plans to convert it into a private "museum." But right now, his collection is stored in trunks and cabinets.

Mort also collects American Indian artifacts found during his years of field work in Arizona, Nevada, and Utah with the Bureau of Reclamation. His collection includes pre-Columbian pieces from Mexico. All of his artifacts were collected for Mort's enjoyment and none are for sale.

He has shown his artifacts in various public schools in Wyoming and Nevada. Mort helps the children appreciate the various articles by describing how the items were found, when they were made, where they were discovered and what they were used for. He then allows the children to handle them.

Mort explained to the children that ancient Persia once extended from India to Greece. A documented history of this country goes back 8,000 years. Early human cultures in Persia are studied from artifacts found near the surface of the earth. Pottery items are predominant, as are terra-cotta (glazed clay) figurines, jewelry, and coins. Modern Persia was established officially in 1935 as Iran.

Portions of his collection have also been on display in the M. H. DeYoung Memorial Museum, San Francisco; Earlham College, Richmond, Ind.; and the University of Nevada at Reno.

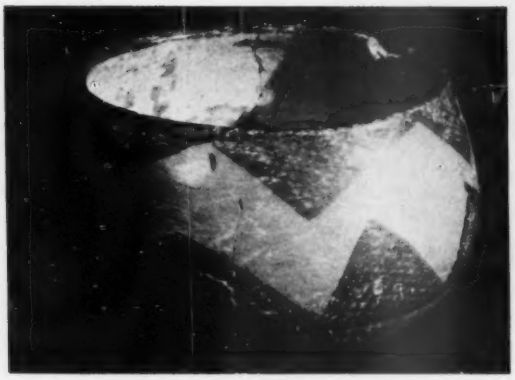
In addition to his job with the Bureau of Reclamation and his art collecting, Dave Mort is a sculptor. Executives from The First National Bank & Trust Co. of Wyoming in Cheyenne spotted some of his signed pieces in Cheyenne's Western Galleries. They liked his work; so they commissioned him to make a statue to be placed in the main lobby of the bank. "Bronc Rider" is about a foot high and is cast in bronze.

Mort is now on an overseas assignment for AID as Chief Advisor for the Government of Zaire (Africa) for the design and construction of a complete extra-high voltage, direct-current transmission system. During his free hours he is probably searching for more pieces to add to his art collection.

Mort's Persian art collection was found in modern-day Afghanistan.

A Greco-Buddhist head from Afghanistan.

Greco-Buddhist stone carving, about 4th Century.



Dating back to 5000 B.C., this bowl is the oldest item in Mort's collection.

Dave Mort handles each of his treasures with care.

The fire altar with attendants.

Bronze pottery, 3500 years old, depicted faces of gods. The face of the sun god, Mithra, is on the smaller.

The intricate workings of this platter suggest an artisan with skill and patience.

Twelfth Century oil lamp.

Photo Courtesy. *The Denver Post* and George Grouter, photographer

THE ENERGY CRISIS

What Reclamation Is Doing About It

Editor's note: *The following article is taken from the speech given by Commisisoner Gilbert G. Stamm before the Western Energy Congress in Wenatchee, Wash.*

The Bureau of Reclamation is both a leading water agency in the West and a leading producer and marketer of energy. The following includes some of the measures Reclamation is employing to help Americans cope with the energy crisis.

During 1973, the Bureau of Reclamation generated 38 billion kilowatt-hours of electric energy from its 50 hydroelectric plants located in 11 western states. This energy was transmitted over the Bureau of Reclamation's interconnected transmission system network. The network includes over 16,000 miles of Reclamation high-voltage transmission lines, and 290 substations. The energy goes to load centers for delivery to the Bureau's 479 wholesale customers.

The Bureau's power sales amounted to 50 billion kilowatt-hours and $163 million in revenues last year.

In addition to revenues from the sale of power, the Bureau receives an estimated $10 million annually from wheeling power for other utilities—public and private—with which it is interconnected. In turn, the Bureau pays wheeling charges to other utilities for wheeling Bureau power to its customers over their transmission systems.

If the hydroelectric energy produced annually at Reclamation's plants and that marketed by the Bureau for the Corps' plants were produced from fossil fuel resources, it would require an equivalent of about 100 million barrels of oil or 24 millions tons of coal.

The electric energy produced at Reclamation plants alone is sufficient to supply the needs of about 5 million residential customers. Assuming three people per family, this would be equivalent to the residential requirements of the cities of San Francisco, Chicago, Dallas, Washington, D.C., and New York.

Oil Conservation

During the past year, the Bureau participated in an oil conservation program in the northern Central

States. To conserve oil in critically short supply the Bureau modified its operations to utilize hydroelectric power as much as possible to meet peak demands. This displaced nonrenewable fossil fuels that would otherwise have been burned in diesel engines and steam plants of public and private utilities. The on-peak energy is returned off-peak from the utilities base-load coal plants.

The effort worked. The Bureau expects to displace enough oil-fired generation in 1974 to conserve the equivalent of about 2 million barrels of oil.

In the near future the impact of the Bureau's operations on the energy situation will be greatly increased because of the construction program now underway.

The Bureau currently has four hydroelectric powerplants under construction. These include the Third Powerplant at Grand Coulee Dam, Washington; Mount Elbert pumped storage powerplant, Colorado; Crystal Powerplant, Curecanti Unit, Colorado; and the Teton Powerplant, Idaho. The authorized installed capacity represented by this construction is over 4 million kilowatts. (Reclamation's present total installed capacity is 9,700,000 kw.)

Third Powerplant

Of course, the Grand Coulee Third Powerplant represents the lion's share of this total and is a mammoth undertaking, both physically and in its ultimate input to the Columbia River power system.

Completion of the initial phase of the new Third Powerplant will add 3,900,000 kilowatts to the present capacity of 2,295,000 kilowatts in the existing left and right powerplants and the two pumping/generating units that lift water to Banks Lake.

Construction on the 100,000-kilowatt Fryingpan-Arkansas pumped-storage powerplant and the associated 11,000-kilowatt Otereo Powerplant is scheduled to be completed in December 1976. This is the first stage of an authorized 200-megawatt pumped-storage plant. Construction on the second stage must await legislation to increase the appropriations ceiling.

Most residents in the Pacific Northwest are familiar with the Teton project which will have a generating capacity of 20,000 kilowatts initially . . . with provision for an addiitonal 10,000 kilowatts in the future.

The Crystal Dam Powerplant will provide some 28,000 kilowatts. However, the completion of the dam will provide the regulation necessary to operate the Curecanti Unit at its full name-plate capacity of 209,000 kilowatts.

Auburn-Folsom South, Calif., and the Bonneville Unit, Utah, are under construction and both will have power although the power facilities are not yet under construction. Auburn-Folsom will have initial capacity of 300,000 kilowatts with provision for ultimate development of an additional 450,000 kilowatts. The Bonneville Unit is designed to provide 133,500 kilowatts of hydropower for irrigation pumping and for commercial sale.

Looking into the future, the Bureau is initiating this year a study of the feasibility of a further extension to the Coulee Dam Third Powerplant. That study is scheduled to be completed in fiscal year 1977. The Bureau is also beginning a feasibility study to identify and evaluate new peaking power potential on the Colorado River storage project.

The Bureau also has identified 43 potential hydroelectric power developments for appraisal and feasibility level investigations. These represent new projects as well as additions to existing projects. The increased annual generation that could be expected from the development of this potential would be nearly 46 billion kilowatt-hours of electric energy.

What Lies Ahead?

The Western Energy Congress is discussing new sources of energy, with emphasis on the coming 5 to 10 years. This could mean the practical development of such presently experimental energy sources as solar heat or the winds. It will call for the location of new oil fields, conversion of vast shale fields to oil production, gasification and liquefaction of coal, expansion of

efforts in the geothermal field, and more rapid installation of nuclear-fired powerplants.

Most of these sources of energy are vitally dependent upon water. This is significant today, for Reclamation is primarily a water agency. The Bureau is interested in and involved with water from every source . . . including surface runoff, ground water, sea water, geothermal water, and atmospheric water. Implementation of Project Independence for full development of energy resources will greatly intensify the Nation's interest in development and use of water.

Within the next 5 to 10 years, the quickest and most profitable avenue for strengthening America's energy reserves is through better management and more efficient use of presently developed water resources. The Bureau's program is directed both to this approach and, in the long-range, to more innovative directions.

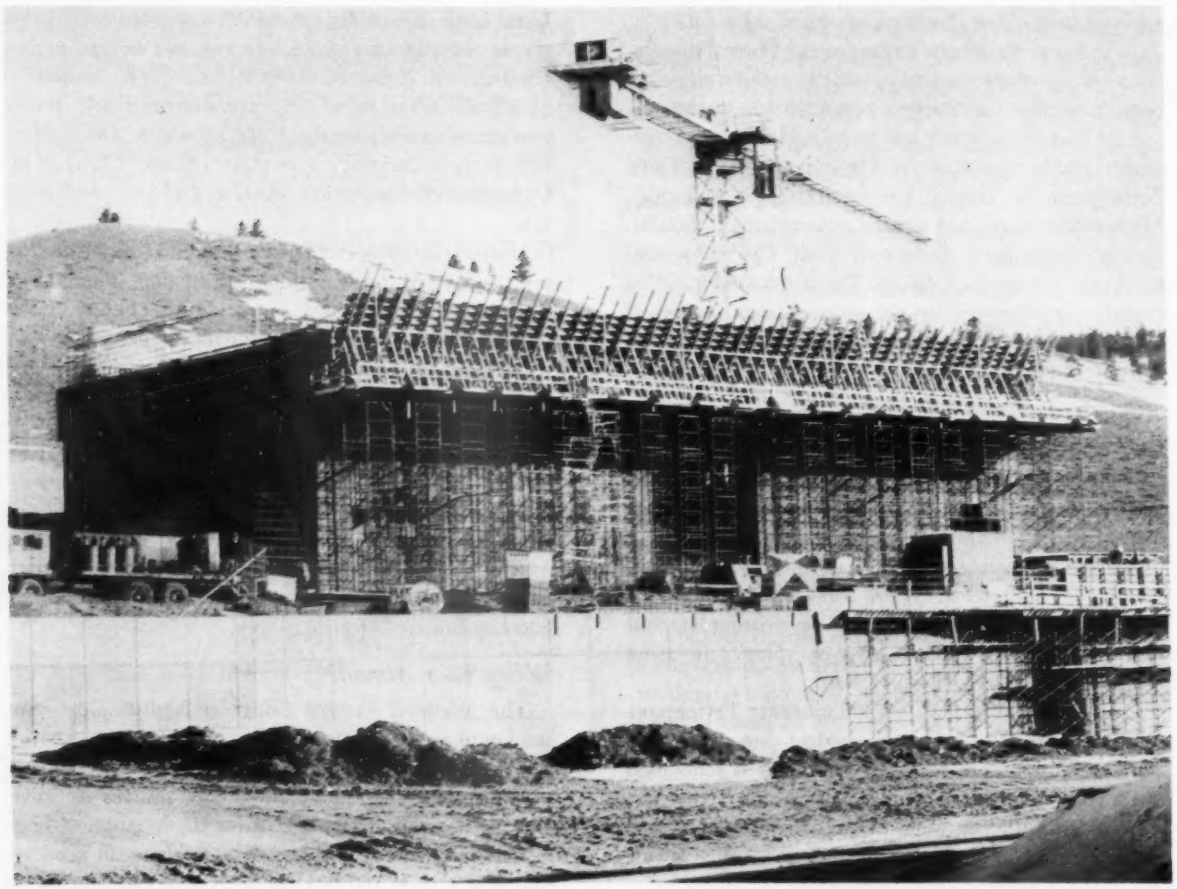
In current irrigation project operations, there is some potential for energy savings on those projects which have to pump their water supplies.

The Bureau is increasing its emphasis on better utilization of presently developed resources through its irrigation management service program. This program is designed to assist farmers in the scheduling both in timing and amounts of irrigation to reduce water, pumping, and fertilizer use, while increasing production and providing more efficient and economic control of drainage problems.

In the Pacific Northwest, the program was initiated first on the Minidoka project in southern Idaho. It has now been expanded to the Boise project, and hopefully it will be in operation on other projects in the near future.

The Bureau works closely with the Department of Agriculture, county agents, and irrigation districts in improving water delivery systems and utilization, which should provide considerable opportunity for better water use and conservation.

In the 17 Western States during 1973, the Bureau of Reclamation used 2.4 billion kilowatt-hours of electric



Mt. Elbert Pumped-Storage Powerplant, Colo.

energy for project irrigation pumping. Even a 5-percent reduction in water pumped would be an energy saving equal to 240,000 barrels of oil.

More innovative programs in which the Bureau of Reclamation is deeply involved are "Project Skywater" and geothermal studies.

Project Skywater

In 1961 Congress directed the Bureau to research cloud seeding. "Project Skywater," as this precipitation management research program is called, has been an intense, coordinated effort of meteorologists, engineers, physicists, chemists, biologists, mathematicians, lawyers, economists, and ecologists to explore and develop the technology of weather modification to meet the Nation's growing need for new supplies of clean water.

The program is now in transition from strictly research and development to a combination of research with operational demonstration. The Colorado River Basin pilot project in the San Juan Mountains of southwest Colorado—an experiment especially designed to study the practicality of winter storm cloud seeding—is now in its fourth year.

The remaining research effort is shifting from winter seeding in mountainous areas to summertime seeding in the high plains region to solve some of the significant unknowns. The High Plains Cooperative program—announced May 8, 1973—is a second generation research effort into the complexities of managing precipitation in the 10 High Plains States.

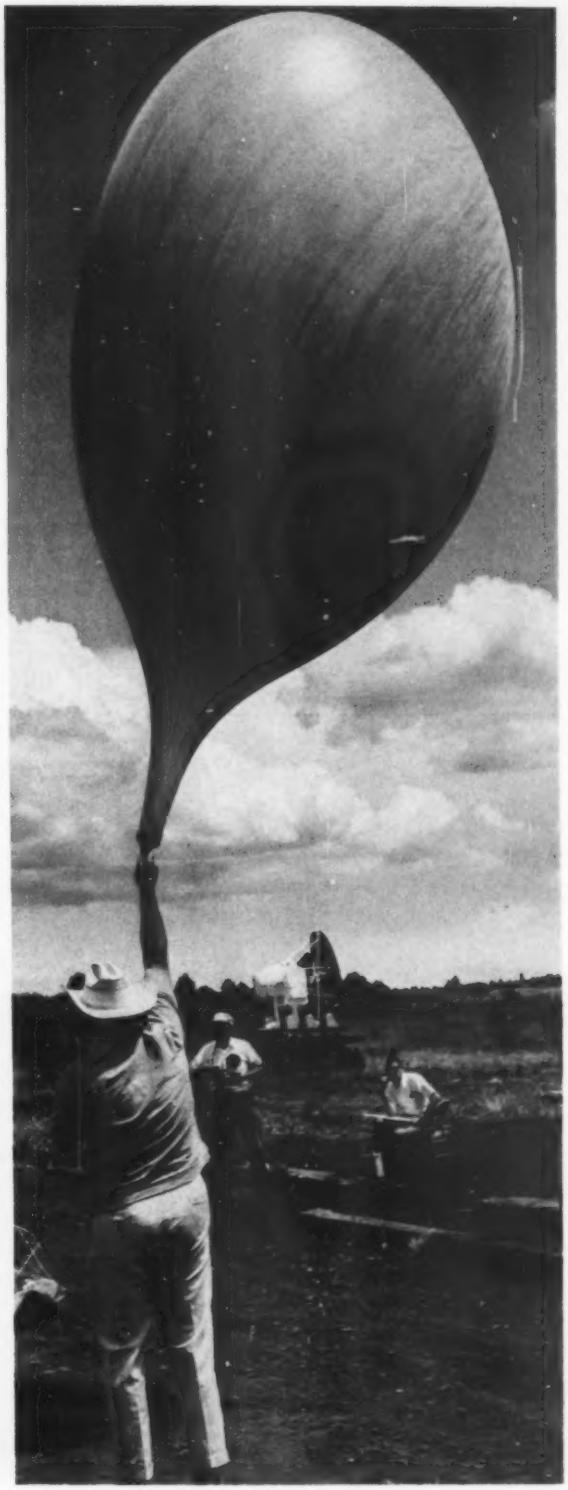
The project is expected to require up to 7 years and will cost up to $20 million. States cooperating in the project will furnish supporting services and facilities and will assist in funding the research.

In the Pacific Northwest, the Cascades wintertime seeding research project, carried out by the University of Washington through contract between the Bureau and the State of Washington, is being concluded this year.

Most of the additional runoff resulting from winter weather modification will be stored in reservoirs and then released to increase power production from downstream hydroelectric plants en route to points of diversion. There it will help satisfy the growing multipurpose demand for water, including development of energy resources such as oil shale and coal.

Geothermal Resources

New water may also be developed from geothermal resources. The Bureau has studied utilization of geothermal brines since 1968. There is an excellent, and perhaps unique, facility at the Imperial Valley, Calif.



Radiosonde released on helium-filled balloon. Radiosonde measures temperature, humidity, and wind velocity.

Workmen assemble the runner for the Third Powerplant turbine.

East Mesa test site. (See *Reclamation Era,* 1974 Spring issue, p. 8.)

Two geothermal production wells have been completed with appropriate surface plumbing, separator, silencers, and a lined holding pond. Two desalting test units have been installed. A well-equipped laboratory is on site. Three additional wells—one to be used for injection—are scheduled for completion this year.

Although the Bureau's geothermal research and development program has been limited to the East Mesa anomaly of the Imperial Valley, it has been estimated that the Valley is underlain by more than 1 billion acre-feet of recoverable hot saline liquids.

The basic objective of Reclamation's geothermal resource investigation program is to develop the required technology and determine the feasibility of desalting geothermal fluids, using the natural heat of the resource. Conceptual studies have shown that the production of fresh water from geothermal brines could also be tied together with production of electric energy in a dual operation resulting in lower costs for both products.

Although Reclamation is interested in both the water and the power aspects of potential geothermal development, we are presently confining our activities to the production of pure water and are leaving the power aspect to others. Many of the difficult technical problems encountered with hot-water geothermal systems—whether the development is for water, mineral, electric power, or process heat—are the same. Thus, information gained through Reclamation's program will be easily transferred to other uses of the resource.

The Bureau has several other programs underway although less exotic than Project Skywater or geothermal investigations. These, too, can provide important contributions to the overall solution of the energy problem.

Coal and Oil Shale

Reclamation has active programs looking at all potentials to insure water availability for development of coal and oil shale. The Bureau is participating in the Northern Great Plains Resource Study as the lead water agency. The prime purpose of that study is to identify the constraints associated with the development of the vast coal resources of the northern Great Plains. We are focusing attention on the physical means of meeting water needs for the development of coal.

In addition, the Bureau is evaluating alternatives for providing water necessary for development of the oil shale in the Upper Colorado River Basin.

Oil shale development and gasification will use a lot of water. Present studies are geared to plants on the demonstration level, small enough to keep control over the amount of water to be used and still large enough to demonstrate feasibility. This must be our policy until water supply problems can be resolved.

Now, let's turn to some areas where Reclamation, through research, improving efficiencies and economies, can step up hydroelectric generation. These begin with more studies in water availability and siting of projects. This can include the possibility of surface-to-underground pools for pumped storage. Then, we can do more in automation and systems control . . . includ-

Geothermal energy is guided from its source through steam discharge pipes to investigation sites.

ing rapid startup and loading of hydromachines . . . and development of better turbine generators and pump turbines.

It has been suggested within the Bureau that we explore possibilities in low-head generation, without major dams, which theoretically could open a vast new area for hydroelectric generation with a minimum of environmental disturbance.

While the Bureau of Reclamation is an engineering and resource development agency with a specialized competency in hydroelectric energy, there is a remarkably broad potential beyond that. There is a substantial area—which of course includes geothermal, and could include both windpower and solar—where the Bureau could make worthwhile contributions.

In areas with prevailing winds, such as much of the Northwest, windpower has possibilities. France, Germany, and the Soviet Union have done fairly extensive research with the winds. There has been at least one rather large and initially productive unit built in the United States . . . in Vermont, during World War II.

With new materials available for airfoils and bearings, new techniques and control devices, and research in variable speed generators, the cumulative energy that could be obtained from windpowered generators warrants investigation.

Solar Energy

While the Northwest does not have the potential for solar power that exists in the Southwest, where

Meteorological data helps researchers pinpoint information useful in weather modification.

radiation from the sun is perhaps three times what it is here, solar power is an area worth exploration.

The use of solar energy in pumping water for forebay storage, for later release through conventional turbine-generators, could be an attractive approach and one which is related to our primary purpose. Solar energy may also have potential for the economic desalting of brackish water.

Outside the Bureau, ideas are being advanced for 100-megawatt solar power towers. These towers—utilizing energy from a field of reflectors focusing on a heat collector high in the air—may be 20 years in the future, which is in the same time frame as nuclear fusion.

A more reasonable possibility, one clearly related to Reclamation and within existing technology, is the development of small solar units to provide power for irrigation pumping. These units are additive, and a field of them could provide a fairly large amount of power where land-use permits.

Reactive Bureaucracies

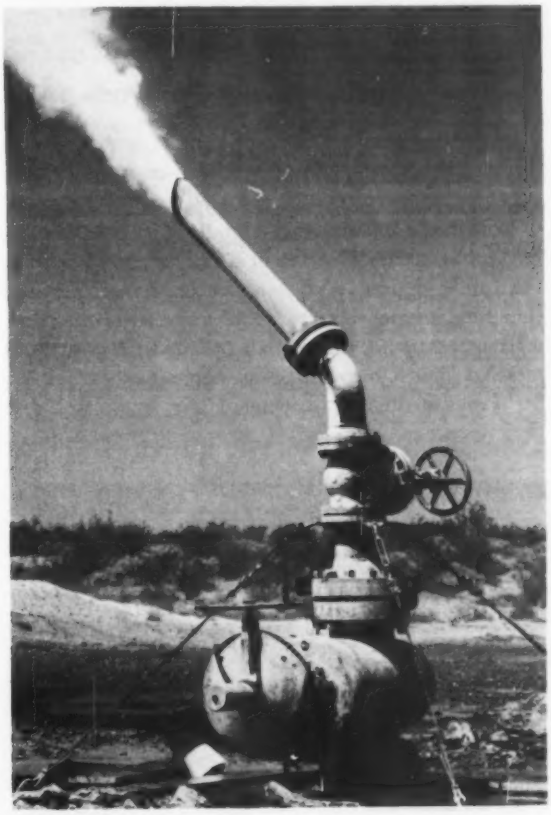
J. H. Wright, director of Westinghouse Environmental Systems, once drew a comparison between the extinct dinosaur and some bureaucracies. Both are too ponderous, too dull, and too slow to respond to the challenges and the needs of changing times.

"All organizations and institutions exist at the pleasure of society," states Mr. Wright, "and will continue to exist for so long as they truly serve that society."

Otherwise they become extinct.

He points out that ". . . the historical role of govern-

A weather modification station in the Snoqualmie Pass area, Wash.



Geothermal energy could produce up to 2.5 million acre-feet of desalted water per year from fluids underlying Imperial Valley, Calif.

Grand Coulee Third Powerplant Construction Office, Wash.

ment in our system is one of passive consent rather than leadership, one of responding to crisis rather than planning to avoid crises."

In fact, the government is usually in the role of playing catch-up ball. The system is designed to respond to the needs, desires, and demands of the people and, therefore, it is not surprising that action in a democracy is likely to *respond* rather than *anticipate*. It pays to remember that if members of Congress were to get too far ahead of their constituencies, they might well lose their seats.

Ounce of Prevention

In spite of this inherent characteristic of our form of government, there is still ample opportunity for a democracy to read the tea leaves, evaluate trends, foresee potential crises, and then act to prevent trouble rather than wait until it is upon us. That approach would be far better than reaction to seek cures on a crash basis. The old adage is as good today as ever: "An ounce of prevention is worth a pound of cure."

We need to apply this philosophy to the case of water. A good many years ago, soil erosion became a crisis. More recently, environmental degradation became a crisis; today, energy shortage has become a crisis. Water supply is likely to become a crisis unless we do things now to prevent it.

For the average water project, the time which elapses between initial planning and water delivery to the kitchen tap is many years—perhaps 20.

Population is growing. Demands on water for people, for mineral resource development, for powerplant cooling, for industry, for agriculture, are all growing.

Funds for research and development seem to be diminishing. Bureau planning funds have been reduced in the past 2 years; atmospheric water research funds have been reduced the past 2 years. Yet atmospheric water is the cheapest source of clean water on the horizon. Time and the finest expertise in the world are being lost.

These actions hasten the day when we will face a water crisis. When that time comes, we will scramble to find a cure, and it undoubtedly will cost many times more than prevention would have cost.

Water is perpetually renewable. Land and water properly used in concert will produce indefinitely. Hydropower is nonpolluting and is not a consumer of water. Used water is frequently reclaimable at a cost. Greater efficiency in use of water is possible, at a cost.

Research is needed to find more effective, more efficient, less costly ways to augment, develop, use, and reuse this vital resource.

The Bureau of Reclamation is one agency that doesn't shrink from the challenge.

It is dedicated to meeting the needs of real people—in homes, in farms, in industry—for food, fiber, and energy, with massive side benefits—physical, economic, environmental, and social.

Our mission is to help solve or prevent society's problem in these areas. We pledge our resources to that end.

news NOTES

O'Brien Is Assistant Commissioner

James J. O'Brien has been appointed Assistant Commissioner for Resource Planning. O'Brien succeeds Warren Fairchild, who transferred last August to become Director of the Water Resources Council.

O'Brien began working for the Bureau of Reclamation in 1949 as a student engineer at the then Chief Engineer's office in Denver. With the exception of 1 year, from mid-1953 to mid-1954 when he served with the California Department of Water Resources, his entire professional career has been with the Bureau.

He came to Washington in 1963, where he served in several capacities in the Planning Division. In 1969, O'Brien was appointed Assistant Chief of the Planning Division; and upon the retirement of Daniel V. McCarthy in June 1973, he was appointed chief of the division.

Bill Martin Named Mid-Pacific Regional Director

Bill Martin has been named the new Regional Director of the Mid-Pacific Region, with headquarters in Sacramento, Calif. He succeeds Robert J. Pafford, Jr., who retired in June 1973.

Bill Martin joined the Bureau of Reclamation in 1962 in Grand Island, Nebr., as an economist on the O'Neill Unit of the Pick-Sloan Missouri Basin program. He also worked in the Denver regional office and in Pueblo, Colo. In 1967 Martin transferred to the Planning Division in Washington, D.C., and in 1969 he was promoted to senior reports coordinator. In 1971 he became Chief, Reports Coordination Branch. In 1973 Martin was promoted to assistant chief of the division.

Martin has B.S. and M.S. degrees in agricultural economics from the University of Arkansas. He is a member of the professional fraternaties, Alpha Tau Alpha and Gamma Sigma Delta.

New Assistant Regional Director in Billings

Lester W. Lloyd, Jr., has been named Assistant Regional Director, Upper Missouri Region, Billings, Mont. He succeeds Martin H. Oleson, Jr., who recently retired.

Lloyd began his career with the Bureau in 1961 as an electrical engineer at the E&R Center in Denver. He advanced to new positions and in 1972 was named Regional Supervisor of Power at Billings.

He is a registered professional engineer in Colorado. His memberships include the Institute of Electrical and Electronic Engineers Transformers Committee, the American National Standards Committee, and the Western Systems Coordinating Council Committee.

Answers to Water Quiz

1. d. 3,000; 2. True; 3. a. 70; 4. c. Carbon dioxide and oxygen; 5. Because content of dissolved gases decreases with an increase in temperature. Thus the polar seas have more life-giving oxygen and carbon dioxide than tropical waters, and are more prolific of life.

Letters to the Editor

Dear Editor:

Love-a-Duck! This was our joyous exclamation when we opened the Winter 1974 issue of the *Era* and saw our son's picture facing page 19. James has been a member of Explorer Post 87 since its beginning.

We are all very proud of the young people and their interests in our world.

Thank you for presenting the article.

—Mrs. Stanley A. Gardner
1629 Garwood Dr.
Pueblo, Colo. 81005

Dear Editor:

I just wanted you to know how much I enjoyed the article "The Huntley Project" which appeared in the Spring 1974 issue of *Reclamation Era.* I'm from Montana and it was enjoyable to read about my old stomping grounds.

There's no question about it, the Huntley project was the driving force in many farmers' lives—and it still is.

I even remember my grandmother talking about "The Dinky," the local train, and how the townspeople felt they had advanced so far when it was installed.

Thanks for the memories.

—J. P. Gunns
San Jose, Calif.

Dear Editor:

In the Water Quiz of the Spring 1974 issue of *Era,* I notice that under question number three (This scroll case, resembling an enormous snail, will be used at:), you had listed Indian Falls Dam as one of the choices. Is there such a dam?

—Carl Dayes
Billings, Mont.

Dear Mr. Dayes:

No, there is no such dam. You will notice on page 32 of that issue that the correct answer is the Grand Coulee Third Powerplant. Occasionally, we test our readers to see how closely they read. Good observation!

—Editor

BACK COVER. Even wind is being considered a viable energy source for the future.